IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Box Patent Application
Assistant Commissioner for Patents
Washington, D.C. 20231

NEW APPLICATION TRANSMITTAL

Transmitted herewith for filing is the patent application of

Inventor(s):   Riku RIMPELA, Jarkko OKSALA, Petri JARVINEN

WARNING: *37 C.F.R. § 1.41(a)(1) points out:*

  "(a) A patent is applied for in the name or names of the actual inventor or inventors.

  "(1) The inventorship of a nonprovisional application is that inventorship set forth in the oath or declaration as prescribed by § 1.63, except as provided for in § 1.53(d)(4) and § 1.63(d). If an oath or declaration as prescribed by § 1.63 is not filed during the pendency of a nonprovisional application, the inventorship is that inventorship set forth in the application papers filed pursuant to § 1.53(b), unless a petition under this paragraph accompanied by the fee set forth in § 1.17(i) is filed supplying or changing the name or names of the inventor or inventors."

For (title):   METHOD FOR INDICATING POWER CONSUMPTION IN A PACKET SWITCHED
COMMUNICATION SYSTEM

CERTIFICATION UNDER 37 C.F.R. § 1.10*
(Express Mail label number is mandatory.)
(Express Mail certification is optional.)

I hereby certify that this New Application Transmittal and the documents referred to as attached therein are being deposited with the United States Postal Service on this date __August 26, 1999__, in an envelope as "Express Mail Post Office to Addressee," mailing Label Number __EL336859837US__, addressed to the: Assistant Commissioner for Patents, Washington, D.C. 20231.

Shauna Murphy

(type or print name of person mailing paper)

Signature of person mailing paper

WARNING: *Certificate of mailing (first class) or facsimile transmission procedures of 37 C.F.R. § 1.8 cannot be used to obtain a date of mailing or transmission for this correspondence.*

*WARNING: *Each paper or fee filed by "Express Mail" **must** have the number of the "Express Mail" mailing label placed thereon prior to mailing. 37 C.F.R. § 1.10(b).*
*"Since the filing of correspondence under § 1.10 without the Express Mail mailing label thereon is an oversight that can be avoided by the exercise of reasonable care, requests for waiver of this requirement will **not** be granted on petition." Notice of Oct. 24, 1996, 60 Fed. Reg. 56,439, at 56,442.*

1. Type of Application

This new application is for a(n)

(check one applicable item below)

☒ Original (nonprovisional)

☐ Design

    ☐ Plant

WARNING: Do not use this transmittal for a completion in the U.S. of an International Application under 35 U.S.C. § 371(c)(4), unless the International Application is being filed as a divisional, continuation or continuation-in-part application.

WARNING: Do not use this transmittal for the filing of a provisional application.

NOTE: If one of the following 3 items apply, then complete and attach ADDED PAGES FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF A PRIOR U.S. APPLICATION CLAIMED and a NOTIFICATION IN PARENT APPLICATION OF THE FILING OF THIS CONTINUATION APPLICATION.

☐ Divisional.

☐ Continuation.

☐ Continuation-in-part (C-I-P).

2. Benefit of Prior U.S. Application(s) (35 U.S.C. §§ 119(e), 120, or 121)

NOTE: A nonprovisional application may claim an invention disclosed in one or more prior filed copending nonprovisional applications or copending international applications designating the United States of America. In order for a nonprovisional application to claim the benefit of a prior filed copending nonprovisional application or copending international application designating the United States of America, each prior application must name as an inventor at least one inventor named in the later filed nonprovisional application and disclose the named inventor's invention claimed in at least one claim of the later filed nonprovisional application in the manner provided by the first paragraph of 35 U.S.C. § 112. Each prior application must also be:

(i) An international application entitled to a filing date in accordance with PCT Article 11 and designating the United States of America; or

(ii) Complete as set forth in § 1.51(b); or

(iii) Entitled to a filing date as set forth in § 1.53(b) or § 1.53(d) and include the basic filing fee set forth in § 1.16; or

(iv) Entitled to a filing date as set forth in § 1.53(b) and have paid therein the processing and retention fee set forth in § 1.21(l) within the time period set forth in § 1.53(f).

37 C.F.R. § 1.78(a)(1).

NOTE: If the new application being transmitted is a divisional, continuation or a continuation-in-part of a parent case, or where the parent case is an International Application which designated the U.S., or benefit of a prior provisional application is claimed, then check the following item and complete and attach ADDED PAGES FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF PRIOR U.S. APPLICATION(S) CLAIMED.

WARNING: If an application claims the benefit of the filing date of an earlier filed application under 35 U.S.C. §§ 120, 121 or 365(c), the 20-year term of that application will be based upon the filing date of the earliest U.S. application that the application makes reference to under 35 U.S.C. §§ 120, 121 or 365(c). (35 U.S.C. § 154(a)(2) does not take into account, for the determination of the patent term, any application on which priority is claimed under 35 U.S.C. §§ 119, 365(a) or 365(b).) For a c-i-p application, applicant should review whether any claim in the patent that will issue is supported by an earlier application and, if not, the applicant should consider canceling the reference to the earlier filed application. The term of a patent is not based on a claim-by-claim approach. See Notice of April 14, 1995, 60 Fed. Reg. 20,195, at 20,205.

☐ The new application being transmitted claims the benefit of prior U.S. application(s). Enclosed are ADDED PAGES FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF PRIOR U.S. APPLICATION(S) CLAIMED.

3. Papers Enclosed

A. Required for filing date under 37 C.F.R. § 1.53(b) (Regular) or 37 C.F.R. § 1.153 (Design) Application

__20__ Pages of specification

__3__ Pages of claims

__6__ Sheets of drawing

(complete the following, if applicable)

☐ The enclosed drawing(s) are photograph(s), and there is also attached a "PETITION TO ACCEPT PHOTOGRAPH(S) AS DRAWING(S)." 37 C.F.R. § 1.84(b).

☐ formal

☐ informal

B. Other Papers Enclosed

__6__ Pages of declaration and power of attorney

__1__ Pages of abstract

_____ Other

4. Additional papers enclosed

☐ Amendment to claims

☐ Cancel in this applications claims _____ before calculating the filing fee. (At least one original independent claim must be retained for filing purposes.)

☐ Add the claims shown on the attached amendment. (Claims added have been numbered consecutively following the highest numbered original claims.)

☐ Preliminary Amendment

☒ Information Disclosure Statement (37 C.F.R. § 1.98)

☒ Form PTO–1449 (PTO/SB/08A and 08B)

☒ Citations

☐ Declaration of Biological Deposit

☐ Submission of "Sequence Listing," computer readable copy and/or amendment pertaining thereto for biotechnology invention containing nucleotide and/or amino acid sequence.

☐ Authorization of Attorney(s) to Accept and Follow Instructions from Representative

☐ Special Comments

☐ Other

5. Declaration or oath (including power of attorney)

NOTE: A newly executed declaration is not required in a continuation or divisional application provided that the prior nonprovisional application contained a declaration as required, the application being filed is by all or fewer than all the inventors named in the prior application, there is no new matter in the application being filed, and a copy of the executed declaration filed in the prior application (showing the signature or an indication thereon that it was signed) is submitted. The copy must be accompanied by a statement requesting deletion of the names of person(s) who are not inventors of the application being filed. If the declaration in the prior application was filed under § 1.47, then a copy of that declaration must be filed accompanied by a copy of the decision granting § 1.47 status or, if a nonsigning person under § 1.47 has subsequently joined in a prior application, then a copy of the subsequently executed declaration must be filed. See 37 C.F.R. §§ 1.63(d)(1)-(3).

NOTE: A declaration filed to complete an application must be executed, identify the specification to which it is directed, identify each inventor by full name including family name and at least one given name, without abbreviation together with any other given name or initial, and the residence, post office address and country or citizenship of each inventor, and state whether the inventor is a sole or joint inventor. 37 C.F.R. § 1.63(a)(1)-(4).

☒ Enclosed

Executed by

(check all applicable boxes)

☒ inventor(s).

☐ legal representative of inventor(s).
37 C.F.R. §§ 1.42 or 1.43.

☐ joint inventor or person showing a proprietary interest on behalf of inventor who refused to sign or cannot be reached.

☐ This is the petition required by 37 C.F.R. § 1.47 and the statement required by 37 C.F.R. § 1.47 is also attached. See item 13 below for fee.

☐ Not Enclosed.

NOTE: Where the filing is a completion in the U.S. of an International Application or where the completion of the U.S. application contains subject matter in addition to the International Application, the application may be treated as a continuation or continuation-in-part, as the case may be, utilizing ADDED PAGE FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF PRIOR U.S. APPLICATION CLAIMED.

☐ Application is made by a person authorized under 37 C.F.R. § 1.41(c) on behalf of *all* the above named inventor(s).

(The declaration or oath, along with the surcharge required by 37 C.F.R. § 1.16(e) can be filed subsequently).

☐ Showing that the filing is authorized.
(not required unless called into question. 37 C.F.R. § 1.41(d))

6. Inventorship Statement

The inventorship for all the claims in this application are:

☐ The same.

or

☐ Not the same. An explanation, including the ownership of the various claims at the time the last claimed invention was made,

 ☐ is submitted.

 ☐ will be submitted.

7. Language

☒ English

☐ Non-English

 ☐ The attached translation includes a statement that the translation is accurate. 37 C.F.R. § 1.52(d).

8. Assignment

☒ An assignment of the invention to ___Nokia Mobile Phones Limited___

 ☒ is attached. A separate ☒ "COVER SHEET FOR ASSIGNMENT (DOCUMENT) ACCOMPANYING NEW PATENT APPLICATION" or ☐ FORM PTO 1595 is also attached.

 ☐ will follow.

9. Certified Copy

Certified copy(ies) of application(s)

Country	Appln. No.	Filed
Finland	981838	August 27, 1998

Country	Appln. No.	Filed

Country	Appln. No.	Filed

from which priority is claimed

- ☒ Is (are) attached.
- ☐ will follow.

NOTE: *The foreign application forming the basis for the claim for priority must be referred to in the oath or declaration. 37 C.F.R. § 1.55(a) and 1.63.*

NOTE: *This item is for any foreign priority for which the application being filed directly relates. If any parent U.S. application or International Application from which this application claims benefit under 35 U.S.C. § 120 is itself entitled to priority from a prior foreign application, then complete item 18 on the ADDED PAGES FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF PRIOR U.S. APPLICATION(S) CLAIMED.*

10. Fee Calculation (37 C.F.R. § 1.16)

A. ☒ Regular application

CLAIMS AS FILED			
Number filed	Number Extra	Rate	Basic Fee 37 C.F.R. § 1.16(a) $760.00
Total Claims (37 C.F.R. § 1.16(c)) 12 − 20 = 0		× $ 18.00	
Independent Claims (37 C.F.R. § 1.16(b)) 6 − 3 = 3		× $ 78.00	234.00
Multiple dependent claim(s), if any (37 C.F.R. § 1.16(d))		+ $260.00	

- ☐ Amendment cancelling extra claims is enclosed.
- ☐ Amendment deleting multiple-dependencies is enclosed.
- ☐ Fee for extra claims is not being paid at this time.

NOTE: *If the fees for extra claims are not paid on filing they must be paid or the claims cancelled by amendment, prior to the expiration of the time period set for response by the Patent and Trademark Office in any notice of fee deficiency. 37 C.F.R. § 1.16(d).*

Filing Fee Calculation $ 994.00

B. ☐ Design application ($310.00—37 C.F.R. § 1.16(f))

Filing Fee Calculation $

C. ☐ Plant application ($480.00—37 C.F.R. § 1.16(g))

Filing fee calculation $

11. Small Entity Statement(s)

☐ Statement(s) that this is a filing by a small entity under 37 C.F.R. § 1.9 and 1.27 is (are) attached.

WARNING: "Status as a small entity must be specifically established in each application or patent in which the status is available and desired. Status as a small entity in one application or patent does not affect any other application or patent, including applications or patents which are directly or indirectly dependent upon the application or patent in which the status has been established. The refiling of an application under § 1.53 as a continuation, division, or continuation-in-part (including a continued prosecution application under § 1.53(d)), or the filing of a reissue application requires a new determination as to continued entitlement to small entity status for the continuing or reissue application. A nonprovisional application claiming benefit under 35 U.S.C. § 119(e), 120, 121, or 365(c) of a prior application, or a reissue application may rely on a statement filed in the prior application or in the patent if the nonprovisional application or the reissue application includes a reference to the statement in the prior application or in the patent or includes a copy of the statement in the prior application or in the patent and status as a small entity is still proper and desired. The payment of the small entity basic statutory filing fee will be treated as such a reference for purposes of this section." 37 C.F.R. § 1.28(a)(2).

WARNING: "Small entity status must not be established when the person or persons signing the . . . statement can unequivocally make the required self-certification." M.P.E.P., § 509.03, 6th ed., rev. 2, July 1996 (emphasis added).

(complete the following, if applicable)

☐ Status as a small entity was claimed in prior application

_____ / _____, filed on _____, from which benefit is being claimed for this application under:

35 U.S.C. § ☐ 119(e),
               ☐ 120,
               ☐ 121,
               ☐ 365(c),

and which status as a small entity is still proper and desired.

☐ A copy of the statement in the prior application is included.

Filing Fee Calculation (50% of **A, B** or **C** above)

$_____

NOTE: Any excess of the full fee paid will be refunded if small entitiy status is established and a refund request are filed within 2 months of the date of timely payment of a full fee. The two-month period is not extendable under § 1.136. 37 C.F.R. § 1.28(a).

12. Request for International-Type Search (37 C.F.R. § 1.104(d))

(complete, if applicable)

☐ Please prepare an international-type search report for this application at the time when national examination on the merits takes place.

13. Fee Payment Being Made at This Time

□ Not Enclosed

    □ No filing fee is to be paid at this time.
(This and the surcharge required by 37 C.F.R. § 1.16(e) can be paid subsequently.)

☒ Enclosed

    ☒ Filing fee $ __994.00__

    ☒ Recording assignment
($40.00; 37 C.F.R. § 1.21(h))
(See attached "COVER SHEET FOR
ASSIGNMENT ACCOMPANYING NEW
APPLICATION".) $ __40.00__

    □ Petition fee for filing by other than all the
inventors or person on behalf of the inventor
where inventor refused to sign or cannot be
reached
($130.00; 37 C.F.R. §§ 1.47 and 1.17(i)) $ _____

    □ For processing an application with a
specification in
a non-English language
($130.00; 37 C.F.R. §§ 1.52(d) and 1.17(k)) $ _____

    □ Processing and retention fee
($130.00; 37 C.F.R. §§ 1.53(d) and 1.21(l)) $ _____

    □ Fee for international-type search report
($40.00; 37 C.F.R. § 1.21(e)) $ _____

NOTE: 37 C.F.R. § 1.21(l) establishes a fee for processing and retaining any application that is abandoned for failing to complete the application pursuant to 37 C.F.R. § 1.53(f) and this, as well as the changes to 37 C.F.R. §§ 1.53 and 1.78(a)(1), indicate that in order to obtain the benefit of a prior U.S. application, either the basic filing fee must be paid, or the processing and retention fee of § 1.21(l) must be paid, within 1 year from notification under § 53(f).

                  Total fees enclosed $ __1034.00__

14. Method of Payment of Fees

    ☒ Check in the amount of $ __1034.00__

    □ Charge Account No. _____ in the amount of
$_____.

    A duplicate of this transmittal is attached.

NOTE: Fees should be itemized in such a manner that it is clear for which purpose the fees are paid. 37 C.F.R. § 1.22(b).

15. Authorization to Charge Additional Fees

WARNING: *If no fees are to be paid on filing, the following items should not be completed.*

WARNING: *Accurately count claims, especially multiple dependent claims, to avoid unexpected high charges, if extra claim charges are authorized.*

[X] The Commissioner is hereby authorized to charge the following additional fees by this paper and during the entire pendency of this application to Account No. ___16-1350___ :

     [X] 37 C.F.R. § 1.16(a), (f) or (g) (filing fees)

     [X] 37 C.F.R. § 1.16(b), (c) and (d) (presentation of extra claims)

NOTE: *Because additional fees for excess or multiple dependent claims not paid on filing or on later presentation must only be paid or these claims cancelled by amendment prior to the expiration of the time period set for response by the PTO in any notice of fee deficiency (37 C.F.R. § 1.16(d)), it might be best not to authorize the PTO to charge additional claim fees, except possibly when dealing with amendments after final action.*

     [X] 37 C.F.R. § 1.16(e) (surcharge for filing the basic filing fee and/or declaration on a date later than the filing date of the application)

     [X] 37 C.F.R. § 1.17(a)(1)–(5) (extension fees pursuant to § 1.136(a)).

     [ ] 37 C.F.R. § 1.17 (application processing fees)

NOTE: *". . .A written request may be submitted in an application that is an authorization to treat any concurrent or future reply, requiring a petition for an extension of time under this paragraph for its timely submission, as incorporating a petition for extension of time for the appropriate length of time. An authorization to charge all required fees, fees under § 1.17, or all required extension of time fees will be treated as a constructive petition for an extension of time in any concurrent or future reply requiring a petition for an extension of time under this paragraph for its timely submission. Submission of the fee set forth in § 1.17(a) will also be treated as a constructive petition for an extension of time in any concurrent reply requiring a petition for an extension of time under this paragraph for its timely submission." 37 C.F.R. § 1.136(a)(3).*

     [ ] 37 C.F.R. § 1.18 (issue fee at or before mailing of Notice of Allowance, pursuant to 37 C.F.R. § 1.311(b))

NOTE: *Where an authorization to charge the issue fee to a deposit account has been filed before the mailing of a Notice of Allowance, the issue fee will be automatically charged to the deposit account at the time of mailing the notice of allowance. 37 C.F.R. § 1.311(b).*

NOTE: *37 C.F.R. § 1.28(b) requires "Notification of any change in status resulting in loss of entitlement to small entity status must be filed in the application . . . prior to paying, or at the time of paying, . . . the issue fee. . . " From the wording of 37 C.F.R. § 1.28(b), (a) notification of change of status must be made even if the fee is paid as "other than a small entity" and (b) no notification is required if the change is to another small entity.*

16. Instructions as to Overpayment

NOTE: ". . . Amounts of twenty-five dollars or less will not be returned unless specifically requested within a reasonable time, nor will the payer be notified of such amounts; amounts over twenty-five dollars may be returned by check or, if requested, by credit to a deposit account." 37 C.F.R. § 1.26(a).
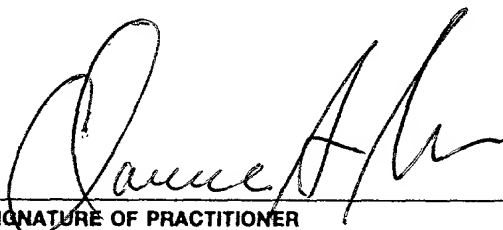
☒ Credit Account No. ___16-1350___

☐ Refund

SEND ALL CORRESPONDENCE TO:

Reg. No. 24,622

Tel. No. (203) 259-1800

Customer No.

_____

SIGNATURE OF PRACTITIONER

Clarence A. Green

_____
(type or print name of attorney)

PERMAN & GREEN, LLP

_____
P.O. Address

425 Post Road, Fairfield, Connecticut 06430

_____

☐ **Incorporation by reference of added pages**

(check the following item if the application in this transmittal claims the benefit of prior U.S. application(s) (including an international application entering the U.S. stage as a continuation, divisional or C-I-P application) and complete and attach the ADDED PAGES FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF PRIOR U.S. APPLICATION(S) CLAIMED)

☐ Plus Added Pages for New Application Transmittal Where Benefit of Prior U.S. Application(s) Claimed

Number of pages added _____

☐ Plus Added Pages for Papers Referred to in Item 4 Above

Number of pages added _____

☐ Plus added pages deleting names of inventor(s) named in prior application(s) who is/are no longer inventor(s) of the subject matter claimed in this application.

Number of pages added _____

☐ Plus "Assignment Cover Letter Accompanying New Application"

Number of pages added _____

☒ **Statement Where No Further Pages Added**

(if no further pages form a part of this Transmittal, then end this Transmittal with this page and check the following item)

☒ This transmittal ends with this page.

Method for indicating power consumption in a packet switched communication system

The present invention relates to a method according to the preamble of
5 the appended claim 1. The invention relates to a communication system according to the preamble of the appended claim 8. The invention relates to a wireless communication device according to the preamble of the appended claim 9. The invention relates to a method according to the preamble of the appended claim 10. The invention
10 relates to a communication system according to the preamble of the appended claim 11. The invention relates to a wireless communication device according to the preamble of the appended claim 12.

The term "wireless communication system" refers generally to any
15 communication system which enables wireless communication between a wireless communication device (MS, Mobile Station) and the fixed parts of the system, when the user of the wireless communication device is moving within the service area of the system. A typical wireless communication system is a public land mobile network PLMN.
20 The majority of wireless communication systems in use at the time of filing this application belong to so-called second generation mobile communication systems, of which the widely known circuit switched GSM mobile communication system (Global System for Mobile Telecommunications) can be mentioned as an example. The present
25 invention is especially well applicable to the mobile communication systems currently under development. In this specification, a GPRS system (General Packet Radio Service) which is being standardized at present, will be used as an example of such a mobile communication system. It is obvious that the invention can also be applied in other
30 mobile communication systems (UMTS, 3G).

As is well known, in modern public land mobile networks (PLMN) based on a cellular network, the system is composed of several mobile stations (MS) using the system, such as mobile phones, and a fixed
35 base station subsystem (BSS). This base station subsystem typically comprises several base transceiver stations (BTS) which are distributed within a geographical area, each base station serving a cell which comprises at least a part of this geographical area.

For example in the GSM system, the data transmission between communication devices such as a mobile station and a base station via one logical radio channel, takes place at the rate of 9.6 kbit/s. The packet switched GSM GPRS system (General Packet Radio Service), based on the GSM system, enhances data transmission, because the same logical radio channel can be used by several different mobile subscribers. For example between the mobile station and the base station, data transmission occurs only when necessary, and the logical radio channel is not reserved solely for communication between one mobile station and one base station. In the system, a so-called virtual data transmission connection prevails between the mobile station and the GPRS system.

The general packet radio service GPRS is a new service under development for the GSM mobile communication system. The functional environment of the GPRS system comprises one or more subnetwork service areas connected to form a GPRS backbone network. The subnetwork comprises several support nodes (SN) of which serving GPRS support nodes (SGSN) will be used as an example in this specification. The serving GPRS support nodes are connected to the mobile communication network (typically to the base station via an interface unit) in such a way that they can provide packet switching services for wireless communication devices via base stations (cells). The mobile communication network provides packet switched data transmission between the support node and the wireless communication device. Different subnetworks, in turn, are connected to an external data network, for example to a public switched data network (PSDN), via GPRS gateway support nodes (GGSN). Thus, the GPRS service enables packet format data transmission between a wireless communication device and an external data network, wherein certain parts of the mobile network form an access network.

In order to use the GPRS services, the wireless communication device first performs a GPRS attach, with which the wireless communication device indicates to the network that it is ready for packet data transmission. The GPRS attach forms a logical link between the wireless communication device and the support node SGSN and

thereby allows short message services (SMS) via the GPRS network, paging services via the support node and notifying the wireless communication device of incoming packet data. Furthermore, in connection with the GPRS attach of the wireless communication device, the support node provides a mobility management function (MM) and performs user authentication. To transmit and receive information, a packet data protocol (PDP) activation is performed, with which a packet data address to be used in the packet data connection is defined for the wireless communication device, wherein the address of the wireless communication device is known in the gateway support node. Thus, in the GPRS attach a data transmission connection is established to the wireless communication device, to the support node and to the gateway support node, and a protocol (e.g. X.25 or IP), a connection address (e.g. X.121 address), a quality of service level and a network service access point identifier (NSAPI) is defined for this connection. The wireless communication device activates the packet data connection with an activate PDP context request, in which the wireless communication device communicates the temporary logical link identity (TLLI), the type of the packet data connection, the address, the required quality of service level, the network service access point identifier and possibly also the access point name (APN).

Firstly, the interference-free function of a communication network, and secondly, the efficient utilization of the resources available are possible only if, for example in the transmission from base stations, the power levels used are as optimal as possible. Further requirements are set by the extending operating, standby and talk times of mobile stations between the loadings of the power supply, especially for the power consumption of mobile stations to control their own operation. However, the transition to the use of new generation communication services, especially packet switched communication networks, requires that the services given to the user are not impaired when compared with conventional circuit switched communication networks. For example in packet switched communication networks, however, it is quite problematic to try to attain this objective because of several reasons described hereinbelow.

The basic idea of the GPRS system is to use packet switched resource allocation, wherein resources, e.g. a logical radio channel for the communication, are allocated when it is necessary to transmit and receive information. Thus, the use of the network and resources available is optimized and used as effectively as possible when compared e.g. to the GSM technique. The GPRS is designed to support applications utilizing intermittent data transmissions which occasionally comprise large quantities of data. In the GPRS system, channel allocation is performed very rapidly, typically within 0.5 to 1.0 seconds, and channel allocation is quite flexible; for example for each wireless communication device, it is possible to allocate from 1 to 8 time periods i.e. time slots on a channel within the scope of one TDMA frame, in other words from 1 to 8 logical channels at the same time. The same resources can be divided between several active wireless communication devices, and an uplink data transmission (i.e. data transmission from the mobile station to the base station) and an downlink data transmission (i.e. data transmission from the base station to the mobile station) can be allocated separately for the users. The GPRS system also supports conventionally used data transfer protocols, such as the TCP/IP protocol. In each time slot, a data packet is transmitted in a radio frequency burst with a limited duration, composed of a series of modulated bits. The time slots are primarily used as control channels and communication channels. The communication channels are used to transmit speech and data, and the control channels are used for signalling between a base transceiver station BTS and wireless communication devices MS.

The most significant difference between the GSM system and the GPRS system is the packet based data transmission, wherein radio channels are not reserved for a single wireless communication device. In the GPRS system based on a cellular system, resources include radio channels used for data transmission (PDCH, Packet Data Channels). Signalling used for controlling in general, is conducted in a PCCCH control channel (Packet Common Control Channel), allocated to be used for that purpose.

More specifically, the PDCH channels are divided into logical radio channels by means of a frame structure (Multiframe), which comprises

52 TDMA frames transmitted repeatedly and divided further into 12 radio blocks each divided into 4 frames, and 4 idle frames. According to Fig. 4, the blocks are sequentially referred to as blocks B0—B11. Furthermore, in Fig. 4, the idle frames are marked with a reference X.

5 In downlink data transmission, these can be used for signalling, and in the uplink data transmission, the USF value refers to these time slots, wherein for example a mobile station can transmit information (Access Burst). The term TDMA (Time Division Multiple Access) refers to dividing a physical radio channel into logical radio channels within a

10 time domain, which is known as such. In more detail, the blocks are also divided into following parts: MAC header (Media Access Control), RLC data block (Radio Link Control) or RLC/MAC control block, and BCS block (Block Check Sequence). Several RLC data blocks of the RLC radio link layer form an LLC level (Logical Link Control) of the LLC

15 data link layer. The RLC data block contains an RLC header and RLC data. The MAC header will be described in more detail hereinbelow, and it comprises for example a USF field (Uplink State Flag).

The terms LLC, RLC and MAC also refer to the protocol layers of a

20 protocol structure according to an OSI model (Open Structured Interface) used in communication. The functions of the known RLC/MAC (Radio Link Control/Media Access Control) layer are necessary between the LLC layer and the wireless communication device. The interface between the LLC layer and the RLC layer is called an RR inter-

25 face. Above the LLC layer, there are known GPRS mobility management functions, SNDCP functions and short message service functions. The RLC/MAC (Media Access Control) layer is specified in more detail in the GSM standard specification. Correspondingly, the SNDCP layer and the LLC layer are specified in more detail in the GSM standard

30 specifications. The MAC is used to allot radio channels for wireless communication devices and to allocate a physical radio channel to a wireless communication device for transmission and reception according to the need. The RLC block is responsible e.g. for requesting resource allocation for the packets to be transmitted towards the mobile

35 communication network.

For multiple access, a TFI identifier (Temporary Flow Identifier) is used in the header information of the data transferred in downlink data

transmission. Each RLC header comprises a TFI identifier, and the same identifier is used to indicate the blocks belonging to the mobile station intended for the communication. According to the GPRS system, all wireless communication devices waiting for data to be transmitted to them from a channel allocated jointly for them, also receive all the blocks of the frame structure, including RLC blocks, decode the information received, along with the TFI identifier, and first after that filter out the blocks with a wrong TFI identifier. For the function of the entire GPRS system, it is extremely important that the data of the control blocks in downlink data transmission is received as accurately as possible. Otherwise the capacity of the system is unnecessarily used to re-transmit data, and inaccurate reception of the control blocks causes problems in resource management. According to prior art, the TFI identifier can have 128 different values, in other words 128 different mobile stations can listen to a radio channel when they are in a transfer state and waiting for information addressed to them.

In uplink data transmission, multiple access is implemented in such a way that the wireless communication device needs a permission for data transmission using a determined radio block. This permission can be given in a variety of ways, for example by monitoring the corresponding blocks which are, however, used in downlink data transmission, in order to activate data transmission as soon as the permission arrives, or in the beginning of the data transmission connection, the blocks intended for this mobile station are indicated to the mobile station. In the GPRS system, resources can also be allocated for one wireless communication device (fixed allocation), but this fixed resource can also be allocated for data transmission intended to another mobile station, without indicating this to the initial mobile station.

However, in the above-described situation of prior art, the problem is that the communication device unnecessarily consumes a great deal of power in a situation where it does not use power primarily for data transmission but monitors the downlink data transmission. This monitoring is performed bearing in mind that the information to be transmitted comprises blocks belonging to the data intended for the mobile station in question.

In the channel allocation in the beginning of the data transmission, the mobile station is notified by means of a bit map of the determined blocks during which transmission and reception is possible. Thus, the data transmission entails a data transmission connection between a base station and a determined wireless communication device. The wireless communication device requests the base station for resources for example on a PRACH channel (Packet Random Access Channel) by means of a PCR message (Packet Channel Request), and the resources allocated for the mobile station for uplink data transmission are indicated in a PIA message (Packet Immediate Assignment). The PIA message contains a list of the PDCH channels available and the value of the USF field to be used. An individual TFI identifier is determined and attached to each RLC data block used in data transmission. When using a SDCCH coding scheme, the USF field contains 3 bits in the beginning of each radio block used in downlink data transmission. Therefore, when multiplexing uplink data transmission, it is possible to use 8 different USF field values. On a PCCCH channel (Packet Common Control Channel), one USF value can be used to indicate the PRACH channel used in uplink data transmission (USF=FREE), and other USF values can be used to allocate uplink data transmission for 7 different mobile stations. The USF value points to the next uplink data transmission block, and the USF value is being constantly transmitted in connection with downlink data transmission.

In digital TDMA systems, such as the GSM system, the mobile station measures constantly the strength of the signals on the radio channels of the serving base station and the adjacent base stations. The mobile station measures constantly the strength of the signals and transmits a measurement report on the signal level of the radio channels to the serving base station. This measurement report is transmitted by the mobile station via a logical control channel SACCH (Slow Associated Control Channel). According to the GSM standard, the measurement report includes for example information on the signal level of the serving base station and of as many as six adjacent base stations. The network operator makes a decision on a channel change and the cell selection, for instance on the basis of the measurement report, but

measurements on signal strength are also made in the base station. Also when the serving base station detects that the signal strength of the radio channel used for data transmission is below a set threshold value, it is possible to change the channel and select a new cell, in which procedure the measurement report transmitted by the mobile station is utilized. Communication is transferred for example onto the base station radio channel of that new cell which has the highest signal level. Thus, in connection with the channel change, data transmission is transferred to take place between the mobile station and this new base station on a new radio channel. By means of the measurement report transmitted by the mobile station, it is also possible to detect in the serving base station whether the signal level of any of the adjacent cells is higher than the signal level of the serving base station, wherein a decision to select a new cell can also be made solely on the basis of this information. The decisions for selecting a new cell are also necessary for directing a load caused by data transmission to another base station.

Typically, the measurements made by the base station are related to power control used in uplink data transmission, to the planning of the use of frequencies, and to resource priorisation. The measurements conducted by the mobile station are typically related to power control used in downlink data transmission, to the selection of the cell or to cell change (handover). Power control denotes, for example, the transmission power used by the mobile station to transmit a radio signal to the base station.

In the GPRS system, mobile stations have to be constantly ready for packet-format data transmission of typically very short duration. Thus, the mobile station has to move quickly from a so-called idle mode to a so-called transfer mode. According to prior art, taking measurements and transmitting a measurement report typically takes approximately 1 second. The base station typically calculates an average of several measurements, and it takes approximately 2 seconds. Furthermore, it takes approximately 0.5 seconds to transmit the measurement results to the mobile station, wherein the cumulative delay is several seconds. In data transmission in the GPRS system (TBF, Temporary Block Flow), the transmission of IP packets (Internet Protocol), i.e. packets

containing address data and information, typically lasts from ca 8 to 40 frames. According to prior art, reports are transmitted in intervals of 104 TDMA frames (Report Period), which thus takes approximately 480 ms. This has the result that already when starting the data transmission, the used power level has to be as advantageous as possible with respect to successful data transmission and desired quality of service (QoS).

The problem is, however, that the mobile stations in the GPRS system should not use too high power levels because of the restricted capacity of the batteries used in them. The use of too high power levels results in a shortened service life of the battery as well as in shortened talk times. In connection with modern GSM phones known from the GSM system, long standby times are known that last for several days in between loadings.

For the purpose of selecting a cell, the mobile station uses an average value to maintain data on the received signal level of the physical radio channel used. The signal level is measured in dBm units. The average is based on at least five samples taken from the radio channel during 3 to 5 seconds. In connection with the multiple access implemented by the GPRS system, this poses the problem that the mobile station has to examine first, in the way described above, whether the data block used in the downlink data transmission belongs to it, and only after that, the measurement data can be included in the average value. Because the mobile station first has to interpret the data block correctly, this has the effect that the measurement results are better than the actual situation. The mobile station conducts measurements constantly, for example on the PDCH channel or BCCH channel it uses.

When two different base stations use one or more radio channels operating in the same frequency range for data transmission, the geographical distance between these base stations and between the cells at the same time has to be sufficient so that they would not interfere with each other. The signal level of the base station far away from the base station is typically so low, due to fading and the effect of the environment, that data transmission is not possible. In order for the mobile communication network to serve its mobile subscribers effectively, it is possible to place one or more base stations serving a

new cell between the above-presented base stations that use the same radio channels, to separate them, which base station uses different radio channels than the above-presented base stations. In analog FDMA systems (Frequency Division Multiple Access) of prior art, such

5   as AMPS (Advanced Mobile Phone Service) and NMT (Nordic Mobile Telephone), a method of the above-described kind is used, wherein a separate frequency band is allocated for each radio channel, i.e. a so-called physical radio channel is produced. In TDMA systems (Time Division Multiple Access), such as D-AMPS, GSM and JDC/PDC, a

10   method of the above-described kind is used for dividing the physical radio channel into logical radio channels in the time level. For example in the digital GSM system, the physical radio channel is divided into eight logical radio channels.

15   Due to the ever increasing use of mobile stations, the resources available have to be efficiently utilized. In this context, it is important to control the power used, especially the power used for transmission. To make the division of different physical radio channel frequencies among different cells (frequency reuse) as efficient as possible, the

20   interference caused by the same radio channel on the corresponding radio channel of another cell has to be as small as possible, which can be described with a C/I parameter (Carrier/Interference Ratio). When the use of the GPRS system based on the GSM system increases in highly optimized GSM networks, the power control becomes even more

25   important in order that the re-devision of the frequencies among different cells as a result of increased interference could be avoided. In this context, it is obvious that lower power levels reduce interference, and at the same time, the size of the cell can be reduced. Consequently, the capacity available can be increased to serve the

30   mobile subscribers. In practice, interference minimization refers to the use of power levels as low as possible in all situations. For each cell, a desired QoS is defined, and on the basis of the measurements, the required power level is defined in order to maintain the quality.

35   Power control can be successfully applied, especially when using frequency hopping in the system. In the GPRS system, power control is used in downlink data transmission only on PDCH channels which are not used as PBCCH and PCCCH channels and which are not allotted

to a BCCH channel frequency. Frequency hopping enables autonomous power control of adjacent cells, and thus the power used can be set as low as possible. If a single frequency is used, it is not possible to lower the value of the powers used in the area of the cell for

5 data transmission without simultaneously lowering the power levels used by the adjacent cells. This results from the fact that in connection with data transmission of a mobile station, a certain minimum value has to be ensured for the C/I parameter.

10 In the GPRS system, the fact that all data blocks may in some situations contain information addressed to two different mobile stations, sets demands for the power control used in downlink data transmission of the base station. In addition to the actual data block addressed to the first mobile station, this information also contains USF

15 information intended for the second mobile station. Thus, a need occurs to change the value of the transmission power for the second mobile station in the middle of on-going downlink data transmission (TBF). This has caused problems, because the change in the power levels has been unpredictable. Furthermore, there may be a group of

20 other mobile stations waiting for data blocks of the downlink data transmission addressed to them in particular, thereby unnecessarily consuming the capacity of their power source. Furthermore, mobile stations do not have data available whether a change in the level of the received signal is caused by a change in the environment of the moving

25 mobile station or a change in the transmission power caused by the base station.

In the GPRS network, the basic idea of the multiple access is that it is possible for the mobile station to receive all the information transmitted by the serving base station. From the received RLC blocks, the mobile

30 station decodes the data allotted to it. In known mobile stations, one known technique that can be mentioned is the so-called AGC method (Adaptive Gain Control), for the purpose of monitoring the effects of the environment on the wireless communication. These effects include, for

35 example, those caused by reflections, drop-outs and fadings. In the predictive AGC method, in order to perform control, both slow changes, e.g. changes due to the motion of the mobile station, and rapid changes caused e.g by drop-outs caused by the environment are monitored. In

the predictive AGC method, the aim is to set the level of the received signal for input in the receiver of the mobile station on a reference level corresponding to the suitable reference level of the amplifier used in the mobile station. Furthermore, it is supposed that the level of the received

5   signal does not change too much during the transmission, and the change is primarily due to signal drop-out. Because of this, the dynamic range of the receiver is typically defined to extend approximately 15 dB above the reference level and 20 dB below the reference level. In this context, one has to bear in mind that in the GPRS system, the

10   difference between the frames (burst) in the strength of the received signal can be 30 dB, depending on which mobile station the data transmission is addressed to. This takes place especially when on-going downlink data transmission is interrupted due to data transmission of higher priority which is addressed to another mobile

15   station. Other alternatives include, for example, transmitting different control messages, such as an acknowledgement message to another mobile station for uplink data transmission.

Another factor affecting the reception is that, according to valid GPRS

20   system specifications, one RLC block whose location is not defined in detail has to be transmitted in a multiframe structure to the mobile stations which are in a packet transfer mode. In particular, this causes the problem that the mobile station does not know which block is intended for it. Thus, power control for setting an amplification for the

25   reference level is difficult because of the missing data.

When using the AGC method and power control for downlink data transmission while the data transmission is constantly interrupted, it is thus not possible to receive all the data blocks in an error-free manner

30   in the mobile station. As a result, some of the data blocks addressed for the mobile station are lost.

When changing to a state in which packets are transferred in data transmission, the communication network has no means to select a

35   suitable transmission power. The transmission powers should be as low as possible to avoid co-channel interference and to optimize power consumption. According to prior art, power control is conducted in such a way that data transmission takes place with the highest transmission

power allowed in the cell in question, after which the power is rapidly reduced with the help of the data given in measurement reports received. Changes in the transmission power entail, however, a maximum change allowed in the transmission power, which is for example 2 dB. This is used to prevent unnecessary oscillation of the transmission power which, in turn, reduces co-channel and adjacent channel interference. In the circuit switched GSM system, the transmission power control takes place in steps of 2 dB at intervals of 60 ms, when the control range is 30 dB. Also in the GPRS system, the step can be 2 dB. It should be mentioned in this context that as the length of the packets to be transferred can vary from one block to hundreds of blocks, the time used for data transfer is 18.46 ms at the shortest and over a second at the longest. However, the measurement results are processed in the way described above, and the problems caused by delays are also presented above.

The purpose of the present invention is to present a considerable improvement in the prior art to ensure a reliable reception for a communication network and mobile stations. The invention is based on the idea that mobile stations are informed of changes in power levels caused by the communication network. The invention is also based on the idea that information intended for a mobile station is indicated to it in advance. Furthermore, the invention is based on the idea that an information block to be received also comprises an information block transmitted at a fixed power level and at a fixed moment.

The method according to the invention is characterized in what will be presented in the characterizing part of the appended claim 1. The communication system according to the invention is characterized in what will be presented in the characterizing part of the appended claim 8. The wireless communication device according to the invention is characterized in what will be presented in the characterizing part of the appended claim 9. The method according to the invention is also characterized in what will be presented in the characterizing part of the appended claim 10. The communication system according to the invention is characterized in what will be presented in the characterizing part of the appended claim 11. The wireless station according to the

invention is primarily characterized in what will be presented in the characterizing part of the appended claim 12.

With the present invention, considerable advantages are achieved
5   when compared with methods and systems of prior art.

Furthermore, a particular advantage of the invention is that the predictive AGC method can be applied more reliably and more effectively. This is especially a result of the fact that the mobile station
10   knows the power level used in the accomplished data transmission, and furthermore, the power level used in the data transmission is indicated to the mobile station, for example by means of an offset value. By means of the invention, data transmission becomes more predictable, which also enables the use of architectural structures of receivers
15   known in connection with the circuit switched GSM system. Conventionally, when designing receivers operating in the GSM system, it has been possible to assume that the signal source, i.e. the base station is unchanging. Thus, the only function has been to predict the effects of the environment on the signal (fading, frequency shift,
20   delay spread) in order to receive the signal. According to the invention, when indicating the power level used by the base station, in the data transmission of the GPRS system it is now possible to distinguish in the mobile station whether a change in the received signal was caused by the base station or by changes in the environment.
25

As is well known, according to the current GPRS specifications, in the data transmission of the frame structure (multiframe) at least one block has to be transmitted with a sufficient transmission power to each mobile station in a transfer mode, which, however, complicates the
30   operation of the communication network. The purpose is to tune the different parameters (timing, frequency, amplification) of the mobile station by means of a reference. The use of this reference transmission is not, however, possible because the mobile stations do not know the moment and location of transmission and the transmission power used.
35   According to a preferred embodiment of the invention, this is arranged in such a way that in the frame structure composed of blocks in the communication, one block, advantageously the first radio block (B0, Fig. 4), is transmitted with the same power than the PBCCH channel or

BCCH channel, if the PBCCH channel is not available. In this way, according to the invention, it is possible to find a reference level in which listening has to be conducted in order to secure reliable reception.

5

When the PDCH channel comprises 12 blocks, a block can be transmitted to a maximum of 96 mobile stations during the frame (single slot). However, this would mean that approxomately 92% of the power used by the mobile station for the reception is wasted. In practice,

10 however, the value (96) is considerably smaller still, because blocks and capacity are also used for other data transmission, such as signalling, and because most of the GPRS mobile stations support multislot data transmission. The result is, as presented above, that the mobile stations unnecessarily consume the capacity of their power

15 source in order to receive a few blocks during a frame.

In the following, the invention will be described in more detail with reference to the appended figures, in which:

20 Fig. 1   shows a protocol stack of prior art, especially a protocol stack of the GPRS system,

Fig. 2   shows the structure of a block according to prior art, especially the structure of a radio block of the GPRS

25   system,

Fig. 3   shows the structure of a block according to the invention, especially the structure of an RLC/MAC block used in downlink data transmission in the GPRS system,

30

Fig. 4   shows a frame structure of prior art, especially the frame structure of the GPRS system,

Fig. 5   shows a preferred system in which the invention can be

35   applied, and

Figs. 6a—6c show the structures of blocks according to other preferred embodiments of the invention, especially the structure of

RLC/MAC blocks used in downlink data transmission in the GPRS system.

The protocol stack of the GPRS system shown in Fig.1 and the
5   structure of the radio block of the GPRS system are specified in more detail in the GSM standard specification.

Fig. 5 shows communication network connections in a packet switched GPRS service. The main element of the infrastructure of the network
10   for the GPRS services is a GPRS support node, GSN. It is a mobility router for implementing the coupling and co-operation between different data networks, for example to a public switched packet data network PSPDN via a connection Gi, or to a GPRS network of another operator via a connection Gp, mobility management with GPRS registers via a
15   connection Gr, and transmission of data packets to wireless communication devices MS, irrespective of their location. Physically, it is possible to integrate the GPRS support node GSN with a mobile services switching center MSC, or it can constitute a separate network element based on the architecture of data network routers. The user
20   data is transferred directly between the support node GSN and a base station system BSS composed of base transceiver stations BTS and base station controllers BSC, via a connection Gb, but between the support node GSN and the mobile services switching center MSC there is a signalling connection Gs. In Fig. 5, solid lines between the blocks
25   represent data communication (i.e. transmission of speech or data in digital format), whereas broken lines represent signalling. Physically, data can be transferred transparently via the mobile services switching center MSC. The radio interface between the wireless communication device MS and a fixed network runs via the base transceiver station
30   BTS and is indicated with the reference Um. References Abis and A denote an interface between the base station BTS and the base station controller BSC, and correspondingly between the base station controller BSC and the mobile services switching center MSC, which is a signalling connection. The reference Gn represents the connection
35   between different support nodes of the same operator. As presented in Fig. 5, the support nodes are typically divided into gateway support nodes GGSN (Gateway GSN) and serving, i.e. home support nodes SGSN (Serving GSN). The GSM system is a time division multiple

access (TDMA) system, in which communication on the radio channel is time-divided and takes place in consecutively repeated TDMA frames, each composed of several (eight) time slots. In each time slot, an information packet is transmitted in a radio frequency burst which has a finite duration and is composed of a group of modulated bits. The time slots are used primarily as control channels and communication channels. The communication channels are used for transmitting speech and data, and the control channels are used for signalling between the base station BTS and wireless communication devices MS.

The output power of the base station (BTS output power) is controlled in the following way. In blocks containing data of a PPCH channel or a PAGCH channel and data of a PBCCH or PTCCH channel, the base station uses a fixed output power, which can be lower than the output power of a BCCH channel (Broadcast Control Channel). The BCCH channel transmits general information related to the packet data transmission. According to prior art, the change in the power of the PCCCH channel in relation to the BCCH channel is indicated (Pb parameter) and transmitted on the PBCCH channel. Now that the PBCCH channel is absent, Pb is set to zero.

In other cases, power control can be used in downlink data transmission. According to the invention, mobile stations listening to the PDCH channel are informed of a change in the transmission power of the PDCH channel by means of a PR field (Power Reduction) to be established in the MAC header of the block. It must be noticed, however, that the transmission power of the base station can only be changed after transmitting data blocks, because the PR field is only defined in the RLC data block of the MAC header.

Furthermore, Fig. 3 shows in more detail the RLC data block of down-link data transmission according to GSM specification, supplemented with the PR field, which is marked with an underlining. The bit map of a RRBP field (Relative Reserved Block Period) indicates the individual uplink block which the mobile station uses to transmit a PACKET CONTROL ACKNOWLEDGEMENT block or a PACCH block to the communication network. If the RRBP field is transmitted as a part of the

RLC/MAC block comprising a RLC/MAC control block, the mobile station transmits the PACKET CONTROL ACKNOWLEDGEMENT block in a given uplink data transmission block.

5 The PT field (Payload Type) indicates whether the RLC/MAC block in question is an RLC/MAC control block or an RLC data block. An FBI field (Final Block Indicator) indicates the last RLC block of the TBF data transmission. The TFI field functions as an identifier indicating the TBF data transmission in which the RLC data block belongs. It was stated

10 above in this specification that the number of served mobile stations is usually less than 96. With respect to the power consumption of the mobile stations, the allocation of resources and the capacity available should rather be conducted for 1 to 3 mobile stations per PDCH channel in downlink data transmission, which leads to a maximum of

15 8—24 mobile stations per each carrier wave (physical radio channel). This means that as most of the mobile stations support multislot allocation, a sufficient number of TFI field values would be 32, which at the same time, however, would be sufficient with respect to efficient use of the resources on the radio channel, and on the other hand the mobile

20 stations would receive information for the most part of the time they use for listening the radio channel. Consequently, the length of the TFI field can be reduced from the known 7 bits to 5 within the invention, since by means of a bit pattern comprising 5 bits, 32 different values can be indicated between 0 and 31. The vacant 2 bits can now be used for the

25 PR field according to the invention. In a corresponding way, the TFI field of the RLC data block can be reduced to contain 5 bits.

Furthermore, another alternative is to use the bits of S/P (Supplementary/Polling) or RRBP fields, but with respect to the power

30 control of downlink data transmission, there would be the drawback that changes would not be possible when using these fields to indicate polling function. Figs 6a—6c present other preferred embodiments of the invention for locating the PR field. Different embodiments enable 32, 64, or 128 TFI values. In the alternative presented in Fig. 6c, the

35 fields are arranged in a manner allowing 32 different TFI values, 2 dB power level indication for downlink data transmission, and the RRBP field is omitted. Thus, acknowledgement is arranged to take place always advantageously 2 blocks after the polling function, i.e. in a fixed

manner and as quickly as possible. This is reasonable for optimizing data transmission, and it would not affect the functionality of the system. In the header, it is possible to use only one bit to indicate whether the polling function is requested or not.

5

Advantageously, the power levels are indicated in relation to the known power level, wherein in connection with the GPRS system, a BCCH channel is used. A PBCCH carrier wave is not available all the time, but a BCCH carrier wave can be continuously monitored. Thus, a reduction
10 in the power of the PDCH channel could be indicated in the same way as on the PBCCH channel by means of a Pb parameter. The PR field (Power Reduction) indicates a reduction in the power used to transmit the next RLC block on the PDCH channel when compared with the PBCCH channel. The reduction is indicated for example according to
15 the following Table 1.

Bit 2	Bit 1	Power reduction
0	0	0—6 dB below the PBCCH level
0	1	8—14 dB below the PBCCH level
1	0	16—22 dB below the PBCCH level
1	1	24—30 dB below the PBCCH level

Table 1

An E-bit (Extension) indicates that the RLC header also contains
20 information which comprises an auxiliary octet (bits 1—8). A BSN field (Block Sequence Number) indicates the order of each RLC data block in each TBF data transmission in 7 bits. An M-bit (More) together with the E-bit and an LI field (Length Indicator) is used to restrict the LLC frames of the TBF data transmission. When the M-bit and the E-bit
25 occur in the same octet, it is possible to use them together (bit pattern 00) to indicate that the mobile station has to ignore all the fields of the RLC/MAC block, except the USF field. With the present invention this is also used to indicate that PT, RRBP, and S/P fields have to be taken into account. The S/P field indicates whether the RRBP field is valid or
30 not.

The present invention is not restricted solely to the above-presented embodiments, but it can be modified within the scope of the appended claims. The invention can also be applied for example in the UMTS system (Universal Mobile Telecommunication System).

5

Claims:

1. A method for controlling the operation of a mobile station (MS) in a packet switched communication network (20) based on a cellular network, which communication network (20) is arranged to transfer information between a base station (BTS) and at least one mobile station (MS) by means of a radio channel, wherein to transfer information, a transmission power on a set level is used on the radio channel, and wherein information that is divided into successive blocks (10, B0—B11) is transmitted from the base station (BTS) to the mobile station (MS) on the radio channel, **characterized** in that said block (10, B0—B11) comprises information (PR) on the transmission power level of any block (10, B0—B11).

2. The method according to claim 1, **characterized** in that said block (10, B0—B11) comprises information (PR) on the transmission power level of another block (10, B0—B11) to be transmitted next.

3. The method according to claim 1, **characterized** in that said block (10, B0—B11) comprises information (PR) on the transmission power level of said block (10, B0—B11).

4. The method according to claim 1, **characterized** in that an RLC block (10, B0—B11) according to the GPRS system is used as said block (10, B0—B11), and that information (PR) on the transmission power level is transmitted by means of an MAC header in the RLC block (10, B0—B11).

5. The method according to claim 4, **characterized** in that the transmission power level (PR) is indicated by means of bits (1—8) contained in an octet (Octet 1—M) of said MAC header, at least some of the bits being arranged for an TFI field (TFI) in a way known as such.

6. The method according to claim 1, **characterized** in that the transmission power level is indicated as a difference (PR) with respect to a known reference level.

7. The method according to claim 6, **characterized** in that said reference level used is a BCCH channel according to the GPRS system.

8. A communication system for implementing packet switched data transmission based on a cellular network, which communication system (20) is arranged to transmit information between a base station (BTS) and at least one mobile station (MS) by means of a radio channel, wherein data transmission on the radio channel is arranged to take place with a transmission power on a set level, and wherein the radio channel is arranged to transmit information that is divided into successive blocks (10, B0—B11), from the base station (BTS) to the mobile station (MS), **characterized** in that the communication system (20) is also arranged to transmit said block (10, B0—B11) containing information (PR) on the transmission power level of any block (10, B0—B11), via a radio channel.

9. A wireless communication device, arranged to function in a communication system, which communication system is arranged to implement packet switched data transmission based on a cellular network, and which communication system (20) is arranged to transmit information between a base station (BTS) and at least one wireless communication device (MS) by means of a radio channel, wherein data transmission on the radio channel is arranged to take place with a transmission power on a set level, and wherein the radio channel is arranged to transmit information that is divided into successive blocks (10, B0—B11), from the base station (BTS) to the wireless communication device (MS), **characterized** in that the wireless communication device (MS) is also arranged to receive said block (10, B0—B11) transmitted by the base station (BTS) on the radio channel, which block (10, B0—B11) contains information (PR) on the transmission power level of any block (10, B0—B11).

10. A method for controlling the function of a mobile station (MS) in a packet switched communication network (20) based on a cellular network, which communication network (20) is arranged to transfer information between a base station (BTS) and at least one mobile station (MS) by means of a radio channel, wherein to transfer

information, a transmission power of a set level is used on the radio channel, wherein information that is divided into successive blocks (10, B0—B11) is transmitted from the base station to the mobile station via a radio channel, **characterized** in that a block (10, B0—B11) that is

5   transmitted repeatedly and at fixed intervals is transmitted with a fixed transmission power in order to establish a reference level.

11. A communication system for implementing packet switched data transmission based on a cellular network, which communication system

10   (20) is arranged to transmit information between a base station (BTS) and at least one mobile station (MS) by means of a radio channel, wherein the information transmission on the radio channel is arranged to occur with a transmission power on a set level, and which radio channel is arranged to transmit information that is divided into

15   successive blocks (10, B0—B11), from the base station (BTS) to the mobile station (MS), **characterized** in that the communication system (20) is also arranged to transmit, at a fixed transmission power, a block (10, B0—B11) that is transmitted repeatedly and at fixed intervals, to establish a reference level and control the mobile station (MS).

20

12. A wireless communication device, arranged to function in the communication system, which communication system is arranged for implementing packet switched data transmission based on a cellular network, and which communication system (20) is arranged to transmit

25   information between a base station (BTS) and at least one wireless communication device (MS) by means of a radio channel, wherein data transmission on the radio channel is arranged to take place with a transmission power on a set level, and which radio channel is arranged to transmit information that is divided into successive blocks (10, B0—

30   B11), from the base station (BTS) to the wireless communication device (MS), **characterized** in that the wireless communication device (MS) is also arranged to receive a block (10, B0—B11) that is transmitted repeatedly and at fixed intervals from the base station (BTS) with a fixed transmission power, to establish a reference level for the wireless

35   communication device (MS) and to control its function.

Abstract:

The invention relates to a method for controlling the function of a mobile station in a packet switched communication network based on a cellular network, which communication network is arranged to transfer information between a base station and at least one wireless communication device by means of a radio channel, wherein to transfer information, a transmission power on a set level is used on the radio channel. Information divided into successive blocks (10, B0— B11) is transmitted from the base station to the mobile station on the radio channel. In the method, the block also contains information (PR) relating to the power level of the transmission. In the method, a block (10, B0— B11) that is transmitted repeatedly and at fixed intervals is transmitted with a fixed transmission power to establish a reference level.
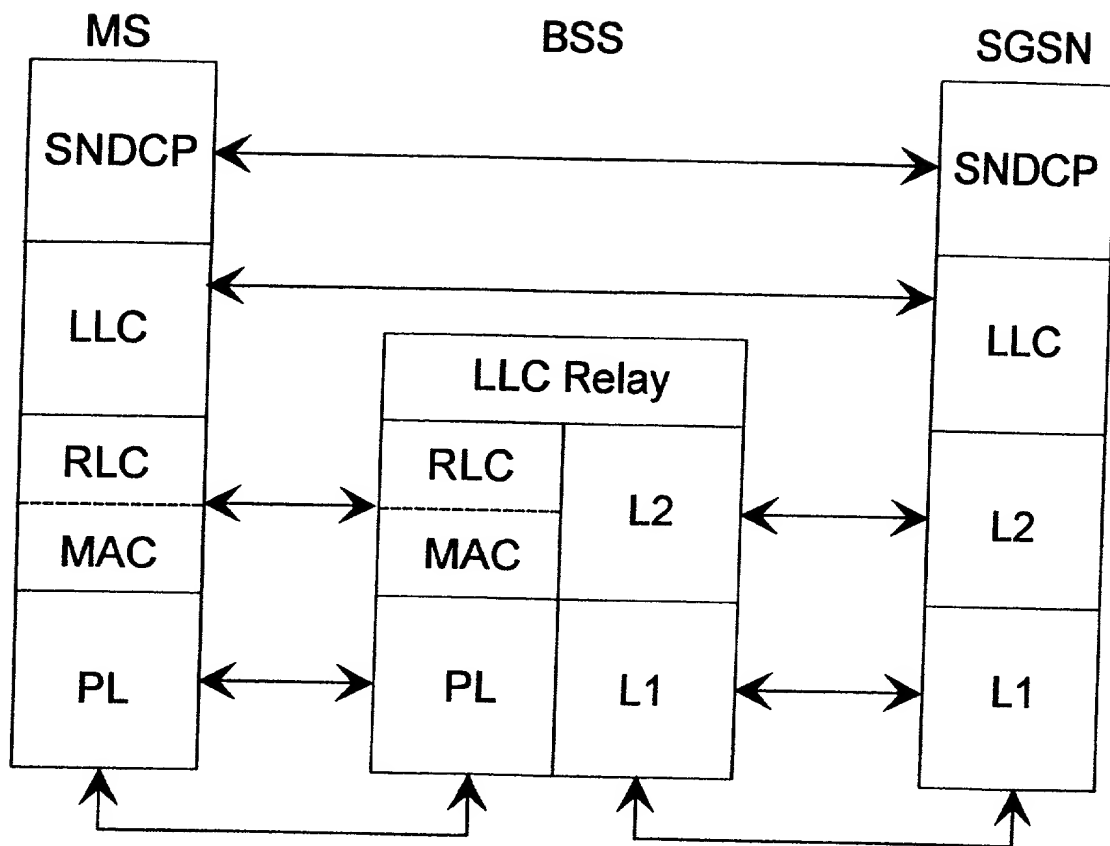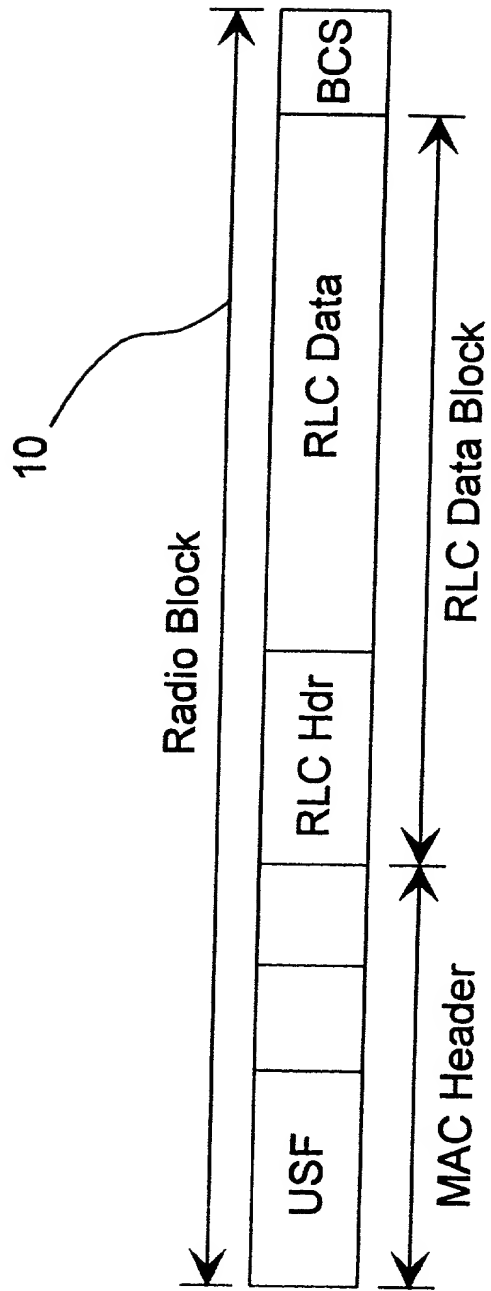
(Fig. 3)

Fig. 1

Radio Block

10

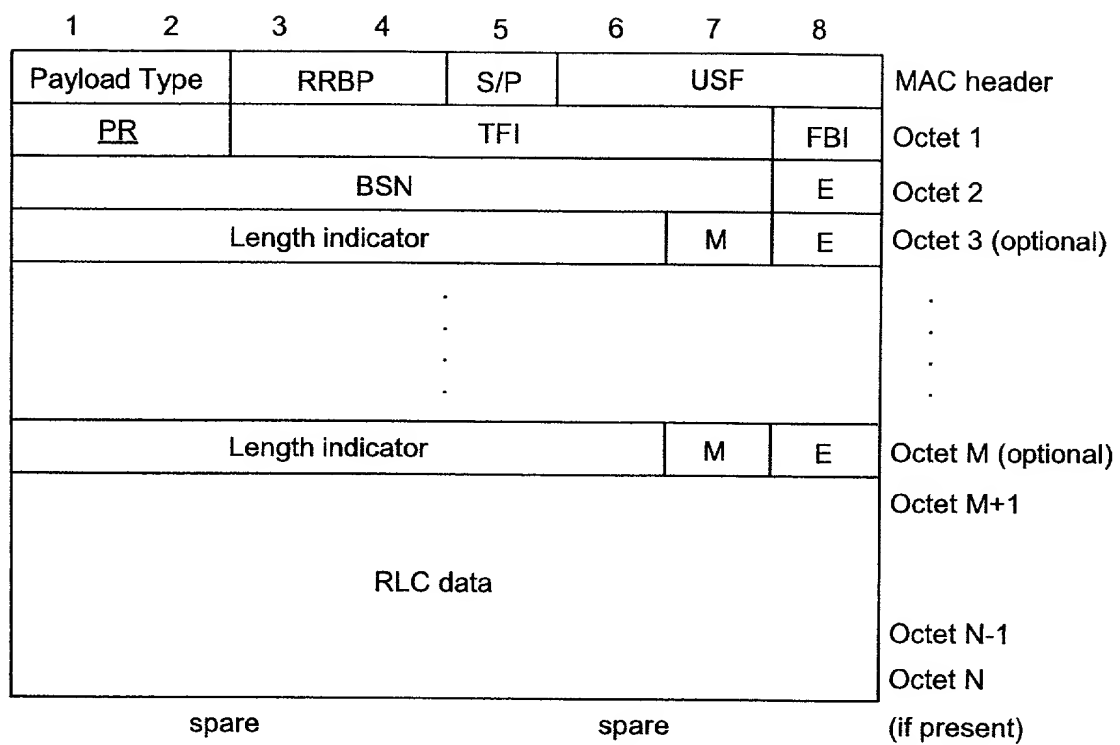| USF | | | RLC Hdr | RLC Data | BCS |

MAC Header

RLC Data Block

Fig. 2

RLC data Block
Downlink

1	2	3	4	5	6	7	8	
Payload Type		RRBP		S/P		USF		MAC header
PR		TFI					FBI	Octet 1
BSN							E	Octet 2
Length indicator						M	E	Octet 3 (optional)
. . . .								. . . .
Length indicator						M	E	Octet M (optional)
								Octet M+1
RLC data								
								Octet N-1
								Octet N
spare			spare					(if present)

Fig. 3

52 TDMA FRAMES

| B0 | B1 | B2 | X | B3 | B4 | B5 | X | B6 | B7 | B8 | X | B9 | B10 | B11 | X |

IDLE FRAME

BLOCK

Fig. 4

20

MS

BSS

Um

BTS —Abis— BTS

A

MSC

GPRS
Registers

Gs

Gr

Gb

SGSN

Other
operator's
GPRS network

GSN

Gp

Gn

GGSN

—— Data traffic
······ Signalling

Gl

Public Switched
Packet Data
Network

Fig. 5

Fig. 6a

1	2	3	4	5	6	7	8	
PT		PR		S/P	USF			MAC header
TFI							FBI	Octet 1

Fig. 6a

Fig. 6b

1	2	3	4	5	6	7	8	
PT		PR		RRBP	USF			MAC header
S/P	TFI						FBI	Octet 1

Fig. 6b

Fig. 6c

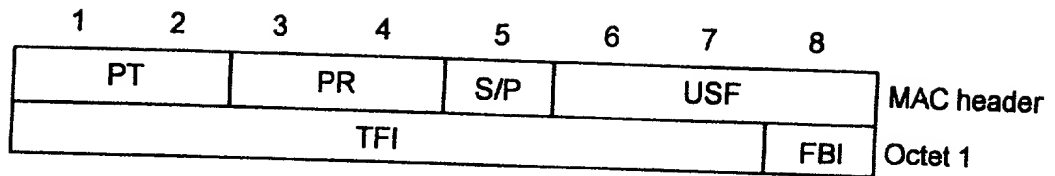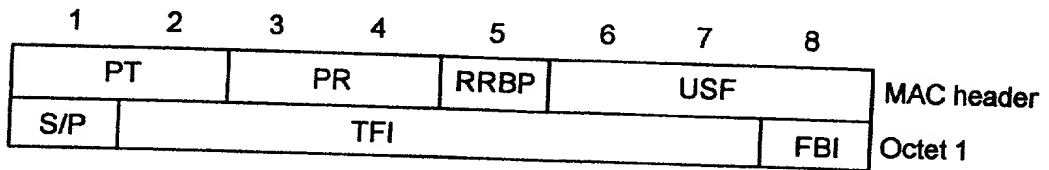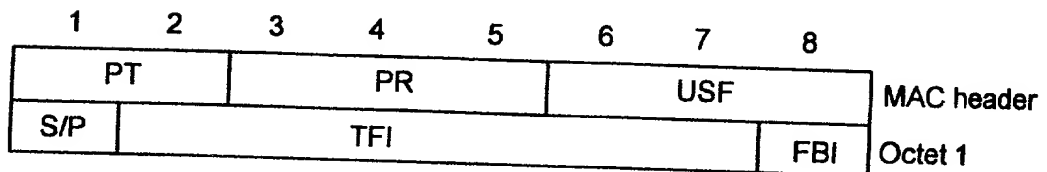| 1	2	3	4	5	6	7	8	
PT		PR			USF			MAC header
S/P	TFI						FBI	Octet 1

Fig. 6c

COMBINED DECLARATION AND POWER OF ATTORNEY

(ORIGINAL, DESIGN, NATIONAL STAGE OF PCT, SUPPLEMENTAL, DIVISIONAL, CONTINUATION OR C-I-P)

As a below named inventor, I hereby declare that:

TYPE OF DECLARATION

This declaration is of the following type:

(check one applicable item below)

[x] original.

[ ] design.

[ ] supplemental.

NOTE: *If the declaration is for an International Application being filed as a divisional, continuation or continuation-in-part application, do not check next item; check appropriate one of last three items.*

[ ] national stage of PCT.

NOTE: *If one of the following 3 items apply, then complete and also attach ADDED PAGES FOR DIVISIONAL, CONTINUATION OR C-I-P.*

[ ] divisional.

[ ] continuation.

[ ] continuation-in-part (C-I-P).

INVENTORSHIP IDENTIFICATION

WARNING: *If the inventors are each not the inventors of all the claims, an explanation of the facts, including the ownership of all the claims at the time the last claimed invention was made, should be submitted.*

My residence, post office address and citizenship are as stated below, next to my name. I believe that I am the original, first and sole inventor *(if only one name is listed below)* or an original, first and joint inventor *(if plural names are listed below)* of the subject matter that is claimed, and for which a patent is sought on the invention entitled:

TITLE OF INVENTION

Method for indicating power consumption in a packet switched communication system

SPECIFICATION IDENTIFICATION

the specification of which:

(complete (a), (b), or (c))

(a) ⌊x⌋ is attached hereto

(b) ☐ was filed on _____ as ☐ Serial No. 0/ _____
    or ☐ Express Mail No., As Serial No. not yet known _____
    and was amended on _____ *(if applicable).*

NOTE: *Amendments filed after the original papers are deposited with the PTO that contain new matter are not accorded a filing date by being referred to in the declaration. Accordingly, the amendments involved are those filed with the application papers or, in the case of a supplemental declaration, are those amendments claiming matter not encompassed in the original statement of invention or claims. See 37 CFR 1.67.*

(c)   ☐ was described and claimed in PCT International Application No.
_____ , filed on _____ and as
    amended under PCT Article 19 on _____ *(if any).*

ACKNOWLEDGEMENT OF REVIEW OF PAPERS AND DUTY OF CANDOR

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information, which is material to patentability as defined in 37, Code of Federal Regulations, § 1.56,

(also check the following items, if desired)

⌊x⌋ and which is material to the examination of this application, namely, information where there is a substantial likelihood that a reasonable Examiner would consider it important in deciding whether to allow the application to issue as a patent, and
☐ in compliance with this duty, there is attached an information disclosure statement, in accordance with 37 CFR 1.98.

PRIORITY CLAIM (35 U.S.C § 119(a)–(d))

I hereby claim foreign priority benefits under Title 35, United States Code, § 119(a)–(d) of any foreign application(s) for patent or inventor's certificate or of any PCT international application(s) designating at least one country other than the United States of America listed below and have also identified below any foreign application(s) for patent or inventor's certificate or any PCT international application(s) designating at least one country other than the United States of America filed by me on the same subject matter having a filing date before that of the application(s) of which priority is claimed.

(complete (d) or (e)

(d) ☐ no such applications have been filed.

(e) ⌊x⌋ such applications have been filed as follows.

NOTE: *where item (c) is entered above and the International Application which designated the U.S. itself claimed priority check item (e), enter the details below and make the priority claim.*

**PRIOR FOREIGN/PCT APPLICATION(S) FILED WITHIN 12 MONTHS
(6 MONTHS FOR DESIGN) PRIOR TO THIS APPLICATION
AND ANY PRIORITY CLAIMS UNDER 35 U.S.C. § 119(a)–(d)**

COUNTRY (OR INDICATE IF PCT)	APPLICATION NUMBER	DATE OF FILING (day, month, year)	PRIORITY CLAIMED UNDER 37 USC 119	
Finland	**981838**	**27 August 1998**	[x] YES	NO ☐
			☐ YES	NO ☐
			☐ YES	NO ☐
			☐ YES	NO ☐
			☐ YES	NO ☐

CLAIM FOR BENEFIT OF PRIOR U.S. PROVISIONAL APPLICATION(S)
(34 U.S.C. § 119(e))

I hereby claim the benefit under Title 35, United States Code, § 119(e) of any United States provisional application(s) listed below:

PROVISIONAL APPLICATION NUMBER   FILING DATE

_____ / _____   _____

_____ / _____   _____

_____ / _____   _____

_____ / _____   _____

CLAIM FOR BENEFIT OF EARLIER US/PCT APPLICATION(S)
UNDER 35 U.S.C. 120

☐ The claim for the benefit of any such applications are set forth in the attached
ADDED PAGES TO COMBINED DECLARATION AND POWER OF ATTORNEY
FOR DIVISIONAL, CONTINUATION OR CONTINUATION-IN-PART (C-I-P)
APPLICATION

ALL FOREIGN APPLICATION(S), *IF ANY*, FILED MORE THAN 12 MONTHS (6 MONTHS FOR DESIGN) PRIOR TO THIS U.S. APPLICATION

_____

_____

_____

NOTE: *If the application filed more than 12 months from the filing date of this application is a PCT filing forming the basis for this application entering the United States as (1) the national stage, or (2) a continuation, divisional, or continuation-in-part, then also complete ADDED PAGES TO COMBINED DECLARATION AND POWER OF ATTORNEY FOR DIVISIONAL, CONTINUATION OR C-I-P APPLICATION for benefit of the prior U.S. or PCT application(s) under 35 U.S.C. § 120.*

POWER OF ATTORNEY

I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith.

(list name and registration number)

Clarence A. Green	(24,622)
Harry F. Smith	(32,493)
Mark F. Harrington	(31,686)

(check the following item, if applicable)

☐ Attached, as part of this declaration and power of attorney, is the authorization of the above-named attorney(s) to accept and follow instructions from my representative(s).

_____

SEND CORRESPONDENCE TO

Clarence A. Green
Perman & Green, LLP
425 Post Road
Fairfield, CT 06430

DIRECT TELEPHONE CALLS TO:
(Name and telephone number)
Clarence A. Green
(203) 250–1800

_____

DECLARATION

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.
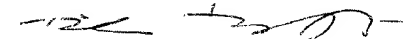
SIGNATURE(S)

Full name of sole or first inventor

Riku   Rimpelä

(GIVEN NAME)   (MIDDLE INITIAL OR NAME)   FAMILY (OR LAST NAME)

Inventor's signature

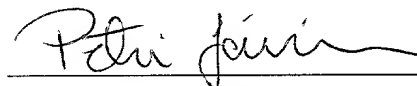Date   August 17, 1999   Country of Citizenship   Finland

Residence   Ahmankatu 19 as. 4, FIN-33530 Tampere, Finland

Post Office Address   Ahmankatu 19 as. 4, FIN-33530 Tampere, Finland

Full name of second joint inventor, if any

Petri   Järvinen

(GIVEN NAME)   (MIDDLE INITIAL OR NAME)   FAMILY (OR LAST NAME)

Inventor's signature

Date   August 17, 1999   Country of Citizenship   Finland
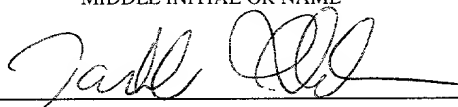
Residence   Insinöörinkatu 46 B 31, FIN-33720 Tampere, Finland

Post Office Address   Insinöörinkatu 46 B 31, FIN-33720 Tampere, Finland

Full name of third joint inventor, if any

Jarkko   Oksala

(GIVEN NAME)   MIDDLE INITIAL OR NAME   FAMILY (OR LAST NAME)

Inventor's signature

Date   August 17, 1999   Country of Citizenship   Finland

Residence   Näyttelijänkatu 21 A 2, FIN-33720 Tampere, Finland

Post Office Address   Näyttelijänkatu 21 A 2, FIN-33720 Tampere, Finland

☐ **Signature** for fourth and subsequent joint inventors. *Number of pages added* _____

<div align="center">* * *</div>

☐ **Signature** by administrator(trix), executor(trix) or legal representative for deceased or incapacitated inventor. *Number of pages added* _____

<div align="center">* * *</div>

☐ **Signature** for inventor who refuses to sign or cannot be reached by person authorized under 37 CFR 1.47. *Number of pages added* _____

<div align="center">* * *</div>

☐ Added page for **signature** by one joint inventor on behalf of deceased inventor(s) where legal representative cannot be appointed in time. (37 CFR 1.47)

<div align="center">* * *</div>

☐ Added pages to combined declaration and power of attorney for divisional, continuation, or continuation-in-part (C-I-P) application.

☐ Number of pages added _____

<div align="center">* * *</div>

☐ Authorization of attorney(s) to accept and follow instructions from representative.

<div align="center">* * *</div>

(if no further pages form a part of this Declaration,
then end this Declaration with this page and check the following item)

☒ This declaration ends with this page.